

- A7
20. (Once Amended) The catalyst system of claim [17] 19 wherein the metal complex to [ionizing] anion precursor molar ratio is from about 10:1 to 1:10.

Add new claims 30-32, as follows:

- sub
SCL
- A8
30. (New) The catalyst system of claim 1 wherein the bidentate ligand stabilizes a square planar geometry.
31. (New) The catalyst system of claim 6 wherein the bidentate ligand stabilizes a square planar geometry.
32. (New) The catalyst system of claim 13 wherein the bidentate ligand stabilizes a square planar geometry.

REMARKS

The specification has been amended to correct a typographical error on page 3 at line 10. Specifically, page 3 as originally filed indicated that the Group 15 or 16 element was covalently bonded to the late transition metal. However, the structure for TM-2 shown on page 15 illustrates a dative bond, rather than a covalent bond. Clearly, the word "covalently" before the word "bonded" in line 10 of page 3 was a typographical error. It is respectfully submitted that no new matter is being introduced by this amendment.

Page 3 has also been amended at line 14 to correct a typographical error. Specifically, the word "of" between the words "oxidation" and "state" has been deleted.

The application, as amended, claims a supported Group 9, 10 or 11 late transition metal catalyst system for polymerization of olefins. Chemical formulae have been provided for the late transition metal compound and the bidentate ligand. Support for this amendment can be found on page 2, lines 21-34 and on page 3, lines 5-14, respectively.

The specification has been amended on page 2 at line 33 to indicate that subscript "r" may be selected from 1, 2 or 3.

New claims 30-32 further define the ligand defined in claims 1, 6 and 13. Support for the new claims can be found on page 3 at lines 27-28.

Rejection under 35 U.S.C. § 121

The Examiner has required restriction under 35 U.S.C. § 121. This will affirm the provisional election with traverse of claims 1-5 and 13-21 made in a telephone conversation with the Examiner on September 28, 1998.

The Applicants disagree with the Examiner's grouping of claims. The Examiner has grouped claims 1-5 and 13-21 as Invention I because the claims are directed to a late transition metal supported catalyst comprising a bidentate ligand, as allegedly opposed to Invention II (claims 6-12) which are "drawn to a late transition metal catalyst including a cocatalyst". However, as in the claims of Invention I, claims 6-12 are in fact drawn to the same late transition metal supported catalyst. Accordingly, claims 1-5 and 13-21 and claims 6-12 have the same technical distinctions that give rise to novelty and unobviousness. Furthermore, claims 1, 6 and 13 have been amended herein to recite a catalyst system for polymerization of olefin monomers. Clearly, the catalyst systems of all claims 1-5, 6-12 and 13-21 have the same utility. Accordingly, the restriction requirement between the groups of claims in the Examiner's Inventions I and II is improper. In an effort to maintain efficiencies on behalf of the Applicants and the Patent Office, claims 6-12 have not been cancelled and the rejections set forth in the outstanding Office Action have also been addressed for claims 6-12. The Examiner is urged to reconsider the restriction requirement between alleged groups of Inventions I and II.

The Examiner states that Inventions I and III are related as product and process of use and that the Inventions II and III are related as product and process of use asserting that "the process of use can be practiced with another materially different product, such as a metallocene catalyst, a Ziegler-Natta catalyst, or a non-supported catalyst". The Examiner will note that amended independent claims 1, 6 and 13 are directed to a catalyst system for polymerization of olefin monomers. Process claims 22, 28 and 29 are dependent on claims 1, 6 and 13, respectively. Therefore, the withdrawn process claims include all of the limitations of the catalyst system claims 1, 6 and 13. Accordingly, the Applicants will seek rejoinder of the withdrawn process claims when the product claims

are found allowable, in accordance with MPEP § 821.04. In view of the rejoinder procedure and in order to expedite prosecution, the Examiner is urged to reconsider the restriction requirement between the product and process of using claims.

Objection to Abstract

The Abstract has been amended as requested by the Examiner to reflect that the stabilized Group 9, 10 or 11 metal complex is immobilized on a "solid support". The Applicants thank the Examiner for raising this point.

Objection to Specification

The Examiner has objected to the use of the term "system" throughout the specification and claims. Specifically, the Examiner has stated that unless the Applicants amend the specification and claims to reflect "the statutory class of invention composition", he will assume that "this is what applicants mean by the non-statutory term". It is respectfully submitted that the word "system" has a plain meaning in any English language dictionary. For example, Webster's New Collegiate Dictionary (1973) defines "system", in part, as follows:

1: a regularly interacting or interdependent group of items forming a unified whole as a(1): a group of interacting bodies under the influence of related forces (2): an assemblage of substances that is in or tends to equilibrium b(1): a group of body organs that together perform one or more vital functions (2): the body considered as a functional unit c: a group of related natural objects or forces d: a group of devices or artificial objects or an organization forming a network esp. for distributing something or serving a common purpose....

It is clear to a person of ordinary skill in the art what is meant by the term "catalyst system" in the present application. It would be truly burdensome for the Applicants to amend the entire specification and claims, especially when the word "system" has a clear meaning. Accordingly, the Examiner is respectfully urged to withdraw his objection. However, should the Examiner maintain his objection he is requested to provide basis for statutory and non-statutory interpretations of the word "system". If the Applicants agree with the Examiner and the application is found otherwise allowable, the Applicants will make the requested amendments at that time.

The Examiner has requested an update of the status of the applications referenced on pages 9, 10 and 16. The specification has been amended to reflect the updated status, where applicable.

The Examiner requested correction to page 3, line 5-10 because "when the bidentate ligand is covalently bonded to the metal, it is required that the ligand itself thus be negatively charged." As noted above, the use of the word "covalently" was used incorrectly in line 10 of page 3 with reference to the bond between the Group 15 or 16 element and the late transition metal. The word "covalently" in the cited passage did not refer to the nature of the bond of the bidentate ligand.

As stated on page 2, line 28, the bidentate ligand "charge balances the oxidation state of MX_r " and on page 3, lines 14-15, "p is the charge on the bidentate ligand such that the oxidation [of] state of MX_r is satisfied." Moreover, on page 4, lines 22-27, the present application states that in the "very most preferred embodiment of this invention", p is zero. Accordingly, it would be incorrect to recite that the ligand must be negatively charged as requested by the Examiner. The Examiner is urged to withdraw the objection to page 3, lines 5-10.

Rejection under 35 U.S.C. § 112, 2nd paragraph

The Examiner has rejected claims 1-5 and 13-21 under 35 U.S.C. § 112, 2nd paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicants regard as the invention. Each of the points raised by the Examiner in Item 9 of the Office Action will be addressed below.

The Examiner has rejected claims 1, 5 and 13 in the use of the terms "structure" and "stabilized" with reference to the bidentate ligand.

Claims 1 and 13 have been amended to delete the word "structure". Likewise, claim 6 has also been amended. The corresponding rejection of claim 5 has been obviated by the amendment to claim 5 which has been made in view of the amendment to claim 1.

The rejection of the word "stabilized" is respectfully traversed. The term "stabilized by a bidentate ligand" has a clear meaning to a person of ordinary skill in the art. Nonetheless, the scope of the term "stabilized" is clarified in amended claims 1, 6

and 13 which provides a formula for the ligand. Support for the amended definition can be found on page 3 at lines 5-15, as originally filed. Accordingly, the Examiner is urged to withdraw his rejection of claims 1, 5 and 13 under 35 U.S.C. § 112, 2nd paragraph.

The Examiner has rejected claim 1 because "the catalyst" lacks antecedent basis. Claim 1 has been amended to replace the word "catalyst" with the words --late transition metal--. The Applicants believe that the rejection of claim 1 has been overcome.

The Examiner has also rejected claim 1, asserting that there should be a recitation of greater than zero catalyst loading since zero loading is permitted by the term "less than 100 micromoles". This rejection is respectfully traversed. Claim 1 recites a catalyst system comprising a Group 9, 10 or 11 metal complex, a bidentate ligand which stabilizes the complex, and a solid support. Accordingly, the catalyst system has a Group 9, 10 or 11 metal complex immobilized on a solid support. The claim goes on to recite the loading of the late transition metal on the solid support. It therefore would be clear to a person of ordinary skill in the art that zero loading is not permitted. Accordingly, the Examiner is respectfully urged to withdraw his rejection of claim 1 under 35 U.S.C. § 112, 2nd paragraph.

The rejection of claims 2 and 14 has been overcome by amendment of the claims to recite "said solid support", which has antecedent basis in claims 1 and 13. Likewise, claim 10 has been amended to recite "said solid support", which has antecedent basis in claim 6. Accordingly, the rejection of claims 2 and 14 under 35 U.S.C. § 112, 2nd paragraph, must be withdrawn.

The Examiner has rejected claims 3 and 15 as lacking antecedent basis for "the supported catalyst" and because the term "homogeneous supported catalyst" makes no sense.

While it is believed that the meaning of "the supported catalyst" is clear to a person of ordinary skill in the art, the Applicants have amended claims 3, 11 and 15 to overcome the Examiner's rejection.

With respect to the Examiner's rejection of the term "homogeneous supported catalyst", the Examiner's attention is directed to page 9, lines 21-24, as originally filed, which states that "The term 'homogeneous, supported catalysts' means that the metal compounds, or their activated complexes, approach even distribution upon the accessible

surface area of the support, including interior pore surfaces in the preferred porous supports." Accordingly, the meaning of the term "homogeneous supported catalyst" in claims 3, 11 and 15 would be readily apparent to a person of ordinary skill in the art.

The rejection of claim 5 in the use of the term "element" has been obviated by amendments to claim 5 in view of amendments to claim 1. Accordingly, the rejection of claim 5 under 35 U.S.C. § 112, 2nd paragraph, must be withdrawn.

The Examiner has rejected claim 18, asserting that "boron" should be --borate-- because it is a monoanionic species. While it is believed that a person of ordinary skill in the art would readily understand the meaning of "tetrakis(perfluorophenyl)boron", the word has been replaced with the word --tetrakis(perfluorophenyl)borate-- in claim 18 to overcome the Examiner's rejection.

Claim 19 has been rejected because it is not clear what is meant by an "anion ionizing precursor". Claim 20 has been rejected because "The catalyst" lacks antecedent basis, the claim should be dependent on claim 19, and the term "ionizing anion precursor" lacks antecedent basis due to word order.

Claims 19 and 20 have accordingly been amended to recite an "anion precursor". The term is discussed on page 6 at lines 11-25. These amendments will overcome the Examiner's rejection of claims 19 and 20.

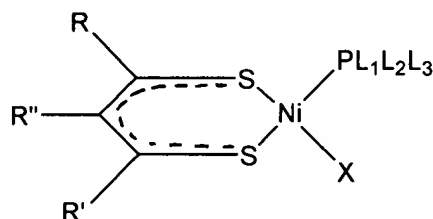
Claim 20 has been amended to recite "The catalyst system of claim 19" to overcome the Examiner's remaining rejection of claim 20. Similarly, claim 8 has been amended to recite "The catalyst system". These amendments will overcome the Examiner's rejection of claim 20.

The Examiner has questioned whether claim 21 should depend on claim 1. The Examiner is advised that the Applicants intended for claim 21 to be dependent on claim 1. The claim is similar to claim 17 which is dependent on independent claim 13. The Applicants however thank the Examiner for requesting confirmation of the dependency.

Rejections under 35 U.S.C. § 102 (b)

The Examiner has rejected claims 1-4 and 13-16 under 35 U.S.C. § 102(b) as being anticipated by Masters (WO83/02907). This rejection is respectfully traversed for the reasons set forth below.

Masters describes nickel (II) complex-catalysts for oligomerization and/or isomerization of olefins. The nickel (II) complexes are of the formula:



The sulfur atoms of the Masters' catalyst are each bonded to nickel and to a group which bridges the two sulfur atoms. However, each of the sulfur atoms do not have any type of R group whatsoever attached thereto. The Examiner will note that the ligand in amended claims 1 and 13 of the present application includes element E which is a Group 15 or 16 element, hence corresponding to the S atoms of Masters' catalyst. However, the formula for the ligand further recites a group R attached to element E which Masters fails to disclose or suggest in any way. Subscripts "m" and "n" are independently 1 or 2. Accordingly, the nickel (II)-containing catalysts of Masters do not fall within the scope of the catalyst system recited in amended claims 1, 6 and 13. The Applicants, therefore, respectfully urge the Examiner to withdraw his rejection of claims 1-4 and 13-16 under 35 U.S.C. § 102(b) as being anticipated by Masters.

The Examiner has rejected claims 1-3, 5 and 13-15 under 35 U.S.C. § 102(b) as being anticipated by Sommazzi (US 5,314,856). This rejection is respectfully traversed for the reasons set forth below.

Sommazzi describes a hydroformylation catalyst and process for the production of alternating olefin/carbon monoxide copolymers. The hydroformylation catalyst is constituted by (a) the solid compound produced from the interaction of $\text{Pd}(\text{O}_2\text{CNEt}_2)_2(\text{NHEt}_2)_2$ with a solid carrier, (b) a mono- or bidentate ligand containing one or two nitrogen or phosphorous atoms, capable of binding to the Pd atom through dative bonds, and (c) a mineral or organic acid, such as trifluoroacetic acid, p-toluene sulfonic acid, sulfuric acid, or alkane sulfonic acids. Hydroformylation catalyst systems, such as that described in Sommazzi, which are well known in the art as being useful strictly to make alternating olefin/carbon monoxide copolymers, but until the Applicants'

discovery, have not been considered useful for making high molecular weight polyethylene. Therefore, for example, a person of ordinary skill in the art of would expect that, in the absence of carbon monoxide, the Sommazzi hydroformylation catalyst system would only produce, at best, oligomers of ethylene, if that. It is generally known to those skilled in the art that catalyst systems such as that described in Sommazzi do not function in the absence of carbon monoxide. Accordingly, the catalyst system of Sommazzi does not fall within the scope of the catalyst system recited in amended claims 1, 6 and 13. The Applicants, therefore, respectfully urge the Examiner to withdraw his rejection of claims 1-3, 5 and 13-15 under 35 U.S.C. § 102 (b) as being anticipated by Sommazzi.

Rejection under 35 U.S.C. § 103 (a)

The Examiner has rejected claims 1, 5, 13, 15 and 17-21 under 35 U.S.C. § 103(a) as being obvious in view of Drent (US 4,849,542). This rejection is respectfully traversed for the reasons set forth below.

Drent relates to a process for preparing oxo-alkanedioic acids or diesters thereof by reacting an alkanedioic acid or diester thereof with carbon monoxide and hydrogen in the presence of a catalyst system. The catalyst system is prepared by combining (a) palladium and/or a palladium compound, (b) a compound containing an anion of an acid having a pKa of less than 2, provided it is neither a hydrohalogenic acid nor carboxylic acid and (c) a bidentate ligand of the formula $R^1R^2-M-R-M-R^3R^4$ where M is phosphorous, arsenic or antimony, R is a divalent bridging group and R^1 , R^2 , R^3 and R^4 are hydrocarbon groups. As the Examiner has noted, Drent's catalyst is neither supported nor dried. Furthermore, the catalyst system described in Drent is disclosed as useful for producing oxo-alkanedioic acids or diesters thereof by reacting an alkanedioic acid or diester thereof with carbon monoxide and hydrogen.

The Applicants respectfully disagree with the Examiner that a person skilled in the art would be motivated to (a) support Drent's catalyst system and (b) reasonably expect such a catalyst system to produce a high molecular weight polymer, even if supported. Certainly, if Drent believed his catalyst system could be used to make high molecular weight polyethylene, he would have suggested such as use. However, he did

not. Also, absent sufficient suggestion, one skilled in the art would not reasonably expect the Drent catalyst to produce high molecular weight polyethylene, even if properly supported. Again, as noted above, until the Applicants' discovery, the catalyst systems of the type claimed have not been considered useful for making high molecular weight polyethylene. There is nothing in Drent which teaches or suggests the catalyst recited in amended claims 1, 6 and 13 for polymerization of olefin monomers.

The Applicants, therefore, respectfully urge the Examiner to withdraw his rejection of claims 1, 5, 13, 15 and 17-21 under 35 U.S.C. § 103(a) as being obvious in view of Drent and the general allegation that it is conventional in the art to use a solid for supporting a catalyst.

The Applicants believe that the amendments and arguments presented herein are sufficient to overcome the Examiner's rejections.

The Applicants also believe that the present application has been patentably distinguished over all of the cited references and is in good condition for allowance. Accordingly, the Applicants respectfully request that the Examiner reconsider the Applicants' application in view of the arguments and amendments presented herein and allow all claims, as amended.

Respectfully submitted,


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